

# Recent Advances in Geriatrics

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A GREAT deal of confusion exists between two aspects of aging, the biological process of aging and aging as we commonly observe it in old people. To distinguish between the two, I suggest that we need both better definitions and new terms. For the past year or so I have been using the following definition of the biological aging process as the basis for my own thinking in this field:

"The biological aging process is the genetically and/or developmentally determined, progressive, and essentially irreversible diminution with the passage of time of the ability of a living organism or of one of its parts to adapt to its environment, manifested as diminution of its capacity to withstand the stresses to which it is subjected, and culminating in the death of the organism."

Some people consider that this is a defeatist and pessimistic point of view because certain beneficial things happen with the passage of time. This is true, of course, but let us call beneficial developments by some other name, maturation or development, for example, but let us not designate as "aging" everything that happens to a living organism with the passage of time. I think we will get much further much faster if we take a definition that makes the straightforward assumption that each individual's clock is sometime going to run down, and that it is going to run down regardless of the incidence of overt illness. Pragmatically, it is sometimes hard to distinguish the effects of illness from the biological aging process, but conceptually I think it can be done. There now

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seems to be fairly general agreement that coronary heart disease or atherosclerosis should not be considered to be part of the aging process. Atherosclerosis occurs with increasing frequency with increasing years, but it is not part of the built-in mechanism of aging. It develops in early life in some people and essentially not at all in others.

I think that it would be particularly useful if we could develop a new name for the biological aging process, which would have fewer emotional overtones. For a time I thought "bio-entropy" would fill the bill, since this carries the implication that living organisms tend eventually toward disorder. When I suggested this to some of my scientific friends, however, I was reminded that "entropy" describes a state rather than a process and that we will have to seek further for the new word we need.

What we are really concerned with in the basic biological process of aging is the influence of the passage of time. Possibly "chronobiology" would serve as the generic descriptive term for the study of the effect of time on living systems. We then might use the term "anachronobiology" for the study of the processes of growth, development, and maturation, and "catachronobiology" for what I have defined previously as the biological aging process. These terms are admittedly clumsy, but as in legal phraseology, it is sometimes necessary to be somewhat clumsy in order to be precise.

## Scope of the Problem

The Bureau of the Census estimates that the total population of the United States on July 1, 1959, including Armed Forces overseas, was 177,103,000, of whom 15,380,000, or 8.7 percent, were 65 years and over (1). The population 65 years and over has increased by about 3.2

million, or 26.1 percent, since 1950. There were 12.2 million persons 65 and over in 1950, and fewer than 9 million in 1940. During the 1950's, this group increased by about 350,000 each year, or nearly 1,000 every day.

In any context, the problems of 15 million people who constitute almost 9 percent of the population deserve respectful attention. In the practice of medicine, however, we are already faced with the fact that the great majority of fatal illnesses occur in mature individuals. The tremendous advances in medicine and sanitation in the last 50 to 75 years have largely eliminated the great scourges, the acute infectious diseases and tuberculosis, which formerly brought death to so many infants and children and young adults.

Fatal illness is becoming increasingly the prerogative of the older age groups. In 1955, 56.5 percent of the deaths in the United States occurred in people over 65, and another 25.8 percent occurred in people 45 to 64 (2). In other words, 82.3 percent of all deaths in 1955 occurred in people who were 45 or older. In 1920, only 50 percent of deaths occurred in this same age group. If we equate death rate with serious illness, which we can probably do with only minor reservations, four-fifths of all serious illnesses now occur in this age group. Already, therefore, all physicians except obstetricians and pediatricians have to pay more and more attention to people 45 and older.

### **Geriatrics as a Specialty**

This leads to the question of whether geriatrics should be developed as a separate specialty of medicine, complete with its own department in the medical schools. At present geriatrics is used rather loosely and usually refers to a sphere of interest rather than to a definitive specialty. Arguments can be advanced on both sides of the question as to whether or not it should become a recognized discipline. The principal arguments in favor of such a development are the sheer numbers of older people in the population and the fact that physicians and others have to be specially trained to give older people the proper attention.

The principal arguments against it are that

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### **Research Projects in Aging**

"Activities of the National Institutes of Health in the Field of Gerontology" is published annually by the Center for Aging Research, National Institutes of Health. This is a compilation of research projects in aging carried out under National Institutes of Health research grants and projects conducted within the laboratories of the Institutes. The 1960 issue lists about 560 projects directly or indirectly related to aging, representing a total annual cost of \$12 million.

The research directly related to aging ranges from studies of the biological aging process to behavioral studies of older people, including studies of their relationships to their families, friends, communities, and jobs. The types of research classified as indirectly or secondarily related to aging includes cancer research, research in cardiovascular disease, arthritis, and other specific illnesses which are commonly found among the elderly.

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most of the diseases and infirmities of age have their beginnings in middle life or even earlier (which leads some observers to conclude that the best "geriatrics" is practiced upon young and middle-aged adults); that it would cut across all established specialties except obstetrics and pediatrics; and that a "good doctor" for patients of 40 can be an equally "good doctor" for patients of 80 if he has the right attitude, which means giving them real attention and good medical care rather than just "tea and sympathy."

I have probably made it obvious that I lean strongly in the direction of not establishing geriatrics as a separate specialty, although in each community a few doctors may wish to identify their interests completely with care of the elderly and become known as geriatricians. I think all doctors except obstetricians and pediatricians should specifically concern themselves with studying and coping with the problems of the older age groups. They should all make specific efforts to prevent the development of disability insofar as this is possible and to treat disease and disability when they occur.

Although the aging process may be differentiated conceptually from disease processes, both

types of process should be treated. Physicians should treat the aging process by conditioning the patient psychologically to accept and live with the fact that he is aging and to make the most of his remaining abilities. Disease should be treated vigorously, not simply to prolong life, but to give the patient an opportunity for a better life. It is important that when disabilities (including senile brain changes) do appear, patients be given the benefit of modern rehabilitation techniques. These may be as simple as urging and assisting old people to get out of bed for a time every day—primarily to permit them to carry out the activities of daily living. Patients should be encouraged to exercise their minds and their bodies. Possibly the greatest single advance in the practice of geriatrics in recent years is recognition of the degree to which senile bedridden patients can be rehabilitated.

Since the health status of people in old age is largely the result of a lifetime of habits of living, it is important that we all study ways and means of getting people of all ages to adopt habits of living that will promote the highest level of health. I regret to say that even members of the medical profession are frequently lax in putting into practice what they know about the promotion of good health.

I should like to quote from a statement before the House Appropriations Subcommittee by Dr. Lewis Thomas, chairman of the department of medicine, New York University College of Medicine (3):

“What will it be like in the year 2000? In 1920 the year 1960 must have seemed like a tremendous distance away, but here we are. There are, in fact, more of us here now, in sheer numbers, than ever before in history. And if there is any certainty in human affairs today, it is the certainty that there will be still more of us, a staggering number of us, in 2000.

“I do not believe in the inevitability of human disease. There is nothing preordained about senile psychosis, any more than there was about childbed fever a century ago. Cancer is not a natural aspect of the human condition, nor is heart disease, nor epilepsy, nor heroin addiction, nor multiple sclerosis, nor insanity, nor blindness, nor any of the lists of maladies which plague us today. Aging

may be inevitable, and death is a part of nature, but disease is not, or needn't be, for humans. We have got to become a healthy species. This, it seems to me, is the task for medical research in the years that lie ahead, not for our own comfort, not for our remote posterity, but for the people who are the same distance from us in time as we are from 1920.”

### Specific Advances in Geriatrics

Before discussing some specific recent advances that are more or less directly related to geriatrics, I should like to mention the recently published “Handbook of Aging and the Individual; Psychological and Biological Aspects.” Some 30 authors contributed to this book, which was edited by Birren. It is a comprehensive readable compendium of existing knowledge about aging in the psychological and biological fields (4).

For the purposes of this discussion, I have picked a number of representative articles culled from those written during the past year or two by the scientists listed in “Activities of the National Institutes of Health in the Field of Gerontology, January 1959.” These papers cover the principal groups of pathological conditions other than cancer, which is a large subject in itself. In addition, I am excluding all studies on the basic biological aging process. Let me describe these studies briefly.

#### *Atherosclerosis and Related Conditions*

Stamler (5), discusses the epidemiology of atherosclerotic coronary heart disease in an excellent summary article with a long bibliography. He comments that while it is perfectly correct to say that no one can definitively predict whether a given person will or will not develop clinical coronary heart disease within the next year or two, long-term prognostications of the actuarial type can be made. Some will be false positives or false negatives, but in general, high-risk individuals can be identified, with the consequent possibility of successful prophylactic intervention.

Based on recent investigations, it is becoming quite possible to estimate the chances of high-risk individuals in specific quantitative terms. It can be roughly estimated that a low-

risk middle-aged man, normal in weight, blood pressure, and serum cholesterol, has 1 chance in 20 of developing clinical coronary heart disease during the age period 45-64. In contrast, a middle-aged man with two or three abnormalities (obesity, hypercholesteremia, hypertension) stands almost one risk in two. These are markedly different risks.

The critical question is whether the risk in high-risk subjects can be prophylactically reduced by correcting defects. The defects are amenable to partial or complete correction by relatively simple medical-hygienic means, the decisive one being dietotherapy. It is not yet known definitely, however, whether the risk of coronary heart disease can be significantly lowered by correcting these defects, although the findings of the life insurance companies on the positive results of correcting obesity are highly suggestive in this regard.

O'Neal and co-workers (6) report that arterial thromboses with myocardial and renal infarcts occur in a large percentage of rats fed a known atherogenic diet to which are added large amounts of saturated fats. Thromboses occur before the formation of significant local intimal lesions, indicating that some hematologic factor is involved.

The same authors discuss the pathogenesis of atherosclerosis and myocardial infarction in a further report of their experimental studies in rats (7). Among 178 rats fed cholesterol, thiouracil, butter, and sodium cholate, 45, or 25 percent, developed myocardial infarcts.

Davis and associates (8) report studies of cholesterol synthesis in the human liver. They conclude that in man the liver supplies a relatively small part of plasma cholesterol, with the extrahepatic tissues being a much more important source than is currently generally believed.

Spain and associates (9) report on the effects of estrogens on resolution of local cholesterol implants. They found that intramuscularly administered estrone in rabbits and mice enhances the resolution of local subcutaneous implants of absorbable gelatin sponge saturated with cholesterol. This occurred in the absence of any alterations in serum cholesterol levels.

Davis (10) comments that the ability of the clinician to demonstrate objectively the pres-

ence of coronary disease with currently available techniques is severely limited. He describes the use of the ballistocardiograph in the diagnosis and management of patients with coronary heart disease, and stresses the value of the ballistocardiographic cigarette test.

Simonson (11) discusses the gravitational effects of postural changes. The changes of the extracranial volume pulse, recorded by means of an impedance plethysmograph, in tilted head-up and head-down positions, are significantly greater in older than in younger men, indicating impairment of circulatory postural regulation with age. Surprisingly enough, this impairment is partially compensated for in coronary patients, possibly due to hyperactive carotid sinus reflexes.

#### *Mental Impairments and Brain Pathology*

Margolis (12) describes pathological observations in senile cerebral disease made with the aid of new techniques and includes a broad survey of the literature.

Obrist and Busse (13) describe the senescent electroencephalogram in a summary of findings on more than 1,200 elderly people. In healthy persons, the EEG undergoes definite but minor alterations with age, though the findings are not correlated with performance on intelligence, learning, or memory tests. In aged psychiatric patients, on the other hand, EEG alterations are more pronounced and there is a significant correlation with mental status. Psychiatric patients with normal or low blood pressure have more diffuse slowing than do those with mild hypertension. It is speculated that an elevated blood pressure may compensate for increased vascular resistance in old age, thus tending to maintain cerebral circulation and preserve a youthful tracing.

Loranger and Misiak (14) report on tests of critical flicker frequency and some intellectual functions in old age. They studied 50 female residents of homes for the aged, all between the ages of 74 and 80. Each patient was given the following battery of tests: critical flicker frequency, Porteus Maze, Wisconsin Card Sorting, Raven Progressive Matrices, Digit Symbol, and PMA reasoning. These particular tests of mental abilities were selected because performance on them declines markedly with age. All

the tests of intellectual functions, except the Porteus Maze, correlated significantly with CFF. The relationship of CFF and intellectual functioning in the aged is tentatively ascribed to a reduced central neural efficiency in old age, which adversely affects both CFF and some intellectual functions.

#### *Collagen and Connective Tissue*

Lansing (15) discusses the role of elastic tissue in atherosclerosis.

Boucek and co-workers (16,17) discuss the properties of fibroblasts, especially with relation to the development of atherosclerosis, and the effects of sex and tissue age upon connective tissue metabolism.

Kohn (18) reports a histological study of the relationship of age to the extent of swelling of connective tissue in the human lung in acid. Connective tissue in pleura and around blood vessels in lungs from young individuals swelled more than in lungs from aged individuals. The distinction between young and old was most marked in connective tissue around blood vessels larger than capillaries and least marked in pleura.

#### *Rehabilitation Evaluation*

It has long since been demonstrated, notably by Rusk and his associates, that intensive rehabilitation efforts will produce dramatic results in severely disabled individuals. Less is known, however, of the kind and amount of rehabilitation effort that is necessary to return bed-bound aged patients to a reasonable degree of self-care (or, preferably, to prevent their becoming bed-bound in the first place) and of the economic feasibility of providing various kinds and amounts of rehabilitation. Muller has made a preliminary report of the study that he and Tobis and others are carrying out to identify the kinds and amounts of rehabilitation activity that are desirable for patients in nursing homes, to develop measurements of the needs of the patients and of their improvement under treatment, and to determine the cost of various levels of treatment (19).

#### *Osteoarthritis*

Silberberg and associates (20) report a study of sternoclavicular joints of 200 persons rang-

ing in age from the 1st to the 10th decades. They report that the incidence and severity of osteoarthritis in this series increased up to the age of 80 years. In individuals over 90 years of age, the incidence of severe arthritis was strikingly decreased. The lesions found in males were more severe than in females, and Negroes seemed to be more susceptible than whites. There was a positive correlation between osteoarthritis and diabetes and chronic renal disease, and between severe osteoarthritis and obesity. No correlation was found to exist between osteoarthritis and arteriosclerosis.

The relationship between arthritis and obesity did not seem to be based on mechanical factors. They report that hyperplasia and hypertrophy of the articular cartilage cells occurred early in the aging process, and the authors postulate that this may have some relationship to the development of osteoarthritis.

#### *Thyroid Response*

Baker and associates (21) studied the responses to the administration of thyroid-stimulating hormone to two middle-aged men (aged 46 and 51) and three elderly men (aged 81, 88, and 92). Responses of the middle-aged subjects were not substantially different from those of the elderly men, and the available evidence, which is meager, does not support the contention that with advancing age there is a decreased responsiveness of the thyroid gland to thyroid-stimulating hormone.

#### *Spinal Reflexes*

Frazier and associates (22) have measured spinal reflexes in rats. They find no significant changes in nerve conduction velocity with age, but do find an increase in central delay of the reflex. Histological analysis of 23 spinal cords in the lumbar region has been completed. The cell counts of the ventral horn show a steady decrease with age.

#### **Conclusion**

As a final comment, I suggest that research on the biological aging process is not going to solve the problems of old age, important as it is in furthering our understanding of basic life processes. We cannot even be sure that re-

search on the medical and social and economic needs of old people is going to solve these problems, but we certainly need to know much more, not only about the factors which lead to eventual death, but what is more important, about those that cause the disabling infirmities of old age. We must find out which infirmities can be prevented and how they can be prevented. We must find out how aging can most effectively be managed in order to give our fellow citizens the best possible opportunity for a decent and worthwhile old age, so that as they approach their terminal years, they may best contribute to their own happiness, to their families, and to society at large. This is not a new idea, but it may be that we are finally approaching the time when we can better fulfill the concept expressed by the ancient Greeks, that the art of living consists in dying young—but as late as possible.

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